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(56) Documents cited

GB A 2072081	GB 1500101
GB 1581725	GB 1203941
GB 1522144	US 1738287

(58) Field of search
G1U
B4W

(54) Testing device

(57) A device for locating an open circuit in a string of Christmas tree lights connected in a series. The device comprises a pliers-like apparatus having opposed movable jaws to releasably grasp a pair of conductors 12, 14 leading to a socket in a series connected string of Christmas tree lights. The pliers are made from a non-conducting material and at least one set of jaws includes a plurality of conductively connected prongs 22 to penetrate the insulated covering of the conductors causing the socket to be short circuited. The pliers include a device (recesses 30, 32) for aligning the conductors with the prongs whereby closing of the opposed jaws causes the prongs to penetrate the insulation and short circuit the socket causing the string of lights to light when an open circuit is shorted.

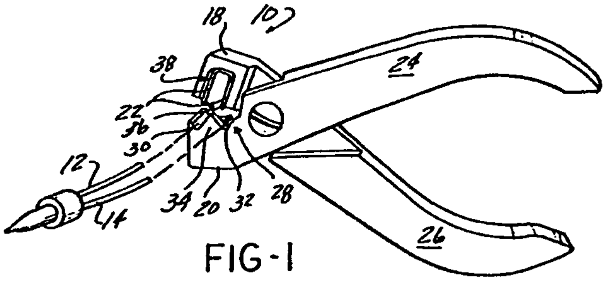

FIG-1

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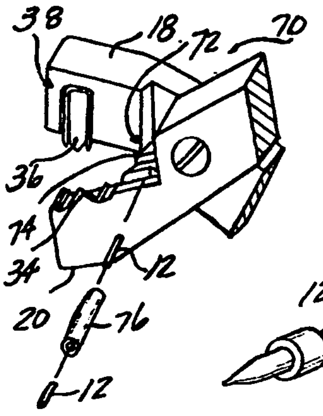

FIG-6

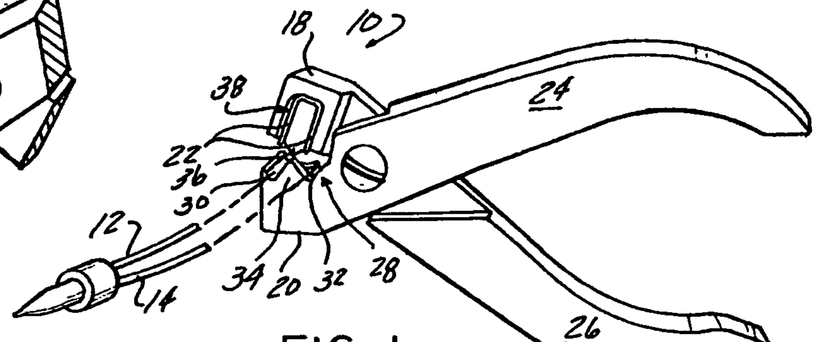

FIG-1

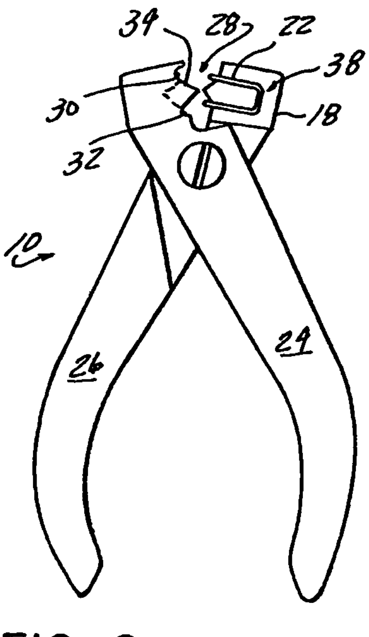

FIG-2

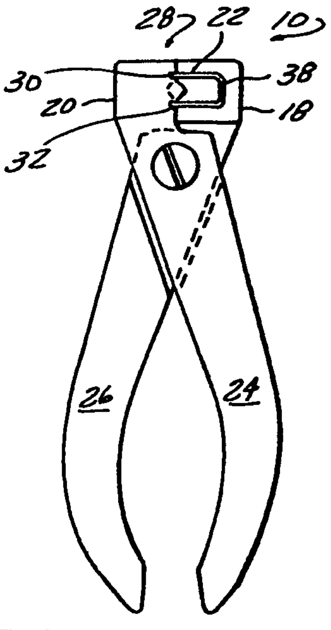

FIG-4

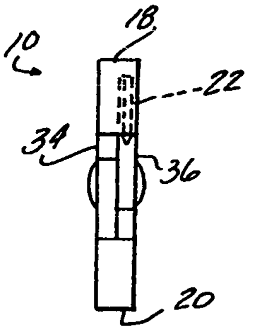

FIG-3

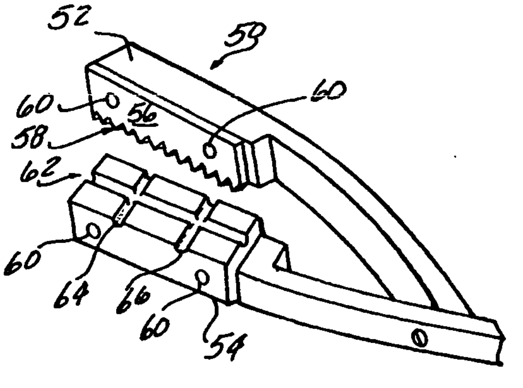

FIG-5

SPECIFICATION

Testing device

The present invention generally relates to the field of electrical circuit testing devices and, in particular, the present invention is concerned with a device for quickly and conveniently locating an open circuit in a series connected plurality of Christmas tree lights.

In the past the most popular type of Christmas tree lights were connected in parallel so that, in the event one light should burn out, only the light would stop burning and the remaining lights would stay on. This type of electrical circuit for the lights allows the defective bulb to be readily found and replaced. With the rapid escalation of energy costs during the past few years, the use of series connected Christmas tree lights has increased. Christmas tree lights connected in series are more energy efficient, but a defective socket or bulb will cause the entire string to go out and it is extremely difficult and time consuming to locate and correct the problem. The problem of a burned out bulb has been addressed by the use of bulbs that short when burned out. However, improperly installed bulbs and defective sockets which create an open circuit are difficult to locate and correct. The present invention addresses this problem with the use of a simple pliers-like device that grasps a pair of conductors leading to a socket in a string of lights to short across the conductors leading to the socket to determine if the socket is defective. A variety of devices have been proposed for testing Christmas tree lights. Examples of electrical testing devices suitable for testing Christmas tree lights in the prior art are disclosed in United States Letters Patent Nos. 1,738,287; 2,763,834; 2,846,644; and 3,760,266. These patents are relevant to the Applicant's invention in that they represent the closest prior art for utilizing an electrical testing device which could be used to test a string of Christmas tree lights.

The aforementioned prior art, in the opinion of the Applicant and the Applicant's attorney, represents the closest prior art and/or information which relates to the present invention of which the Applicant and the Applicant's attorney are aware.

The present invention, which will be described in greater detail hereinafter, comprises a device for locating an open circuit in a string of lights connected in series. The string of lights comprises a conductor with an insulated covering extending between a plurality of sockets. Each socket is configured to releasably receive a light bulb, and conductor ends are connected to a plug which, when connected to a source of electricity, completes the electrical circuit and lights the lights. The device for testing for an open circuit comprises a pliers-like apparatus which has one opposed movable jaw and another opposed movable jaw to releasably grasp a pair of conductors leading to a socket in the string of lights. A plurality of conductively interconnected prongs are carried by one of the opposed jaws wherein closing the opposed jaws causes the prongs to penetrate the insulated covering of the conductor which short circuit's the socket. When the string of lights has been connected to a source of electricity and the lights do not light, the cause of the problem is invariably an open circuit usually at one of the light sockets. By systematically shorting across each socket in turn as described above, the defective socket is readily identified when it has been shorted by the above-described device and the string of lights is lighted.

In a preferred embodiment the pliers are made from a molecular disoriented material which defines a non-conductor, such as reinforced nylon plastic made by the Dupont Company. The preferred embodiment also includes a device for aligning the conductors with the prongs wherein closing of the opposed jaws causes the prongs to easily penetrate the insulation and short circuit the socket that is being tested.

It is therefore a primary object of the present invention to provide a new and improved device for detecting an open plug in a series of Christmas tree lights.

It is a further object of the present invention to provide such a device in the form of a pliers-like tool having opposed jaws and at least two prongs carried by one of the jaws to penetrate the conductor insulation and short the open plug.

It is yet another object of the present invention to provide such a device for detecting an open plug that is made from a non-conducting material to prevent electrical shock to the user.

It is a further object of the present invention to provide an aligning device in the opposed jaws which aligns the conductors with the penetrating prongs.

It is also a further object of the present invention to provide a pliers-like tool for detecting an open plug in a series of Christmas tree lights that includes a crimping device for splicing a broken wire.

It is yet another object of the present invention to provide a pair of conductively interconnected prongs for penetrating the conductor insulation.

It is yet a further object of the present invention to provide a pocket in one of the opposed jaws for releasably supporting the prongs so that they can be easily replaced.

Further objects, advantages and applications of the present invention will become apparent to those skilled in the art of electrical testing devices when the accompanying description of one example of the best mode contemplated for practicing the invention is read in conjunction with the accompanying drawing.

The description herein makes reference to the accompanying drawing wherein like reference numbers refer to like parts throughout the various several views, and wherein:

Figure 1 illustrates a broken perspective view of the device of the present invention;

Figure 2 illustrates a front view of the device of Figure 1 in an open position;

Figure 3 illustrates an end view of the device of Figure 1 in a closed position;

Figure 4 illustrates a front view of the device of Figure 1 in a closed position;

Figure 5 illustrates an alternate construction of the device of the present invention; and

Figure 6 illustrates an alternate construction of the device of Figure 1 which includes a crimping tool for splicing a broken conductor.

Referring now to the drawing, there is illustrated at 10 one example of the present invention in the form of a pliers-like device for locating an open circuit in a string of lights connected in series. The device 10 is adapted to releasably grasp a pair of conductors 12, 14 leading to a Christmas tree light and socket 16 and determine if an open circuit exists in the light and socket 16.

The device 10 comprises a pliers-like apparatus having one opposed movable jaw 18 and another opposed movable jaw 20 to releasably grasp the pair of conductors 12, 14. The one opposed movable jaw, as shown in Figures 1, 2 and 4, carries a plurality of conductively interconnected prongs 22 so that the prongs can easily penetrate the insulation surrounding the conductors the short and light and socket 16. The means 28 for aligning the conductors with the conductively interconnected prongs 22 comprises a pair of spaced transverse grooves 30, 32 formed in the other opposed movable jaw 20, and a pair of opposed raised peaks 34, 36 are positioned between the transverse grooves 30, 32 and lead into the groove to guide the conductors 12, 14 into the spaced grooves as the jaws are closed. Preferably, the opposed raised peaks 34, 36 overlap in a scissors-like fashion to aid in separating and guiding the conductors into the transverse grooves 30, 32 as shown in Figure 3.

In the preferred embodiment the conductively interconnected prongs 22 are formed from a double-pointed tack with the spacing between points configured to conform and align with the spacing between the pair of spaced transverse grooves 30, 32. The one opposed movable jaw 18 comprises a prong supporting jaw having a prong supporting recess 38 formed in the jaw 18 to snugly receive the double-pointed tack 22. If the points become dull or bent after repeated use, the double-pointed tack can be easily replaced using a commercially available product.

Figure 5 of the drawing illustrates at 50 an alternate form of the device of the present invention which comprises a pliers-like device having opposed jaws 50, 52. Preferably, the jaws 50, 52 are made from a plastic, non-conducting material, as well as the handles (not shown). The opposed jaw 52 has attached thereto a strip of metal 56 which has formed along a lower edge a plurality of serrations 58 which are sufficiently pointed to penetrate the conductor insulation and define the plurality of conductively interconnected prongs. Fasteners 60, such as screws or rivets, are used to secure the strip of metal 56 to the jaw 52.

The device 50 also includes an anvil strip 62 which includes a pair of opposed, spaced transverse grooves 64, 66 to nestingly receive conductors 12, 14 (not shown in Figure 5) and allow the serrations 58 to penetrate the insulation of the conductor and short the light and socket 16. The anvil strip 62 is secured to the jaw 54 by a plurality of fasteners 60.

Figure 6 of the drawing illustrates at 70 another alternate form of the device illustrated in Figure 1. The device 70 comprises a pair of opposed jaws 18, 20 to releasably grasp a pair of conductors leading to a socket in a series connected string of Christmas tree lights. The pliers are made from a non-conducting material and at least one set of jaws includes a plurality of conductively connected prongs to penetrate the insulated covering of the conductors in a manner described above. The device 70 further includes a crimping means 72 for sleeving or repairing a break in a conductor 12 leading to the socket and light 16, as shown in Figure 1 of the drawing. The crimping means 72 comprises a pair of raised ridges 74 for crimping a sleeve 76 to conductively interconnect the broken wire or conductor 12. The conductor 12 must first be stripped of its insulation at the ends to be interconnected. The sleeve 76 comprises in the preferred embodiment a conducting tube of soft copper which is surrounded by an insulating outer layer. When the bare ends of the conductor 12 are inserted into the copper interior of the sleeve 76 and the sleeve is inserted into the jaws of the device 70, pressure on the handles of the pliers-like device 70 causes the ridges 74 to collapse the copper tube and grasp the bare ends of the conductor 12 joining the conductor into a conductively intact wire.

It can thus be seen that the present invention has provided a new and improved device for detecting an open circuit in a series string of Christmas tree lights which is simple to use and economical to manufacture.

It should be understood by those skilled in the art of electrical testing devices that other forms of the Applicant's invention can be had, all coming within the spirit of the invention and the scope of the appended claims.

Having thus described my invention, what I claim is:

CLAIMS

1. In a device for locating an open circuit in a string of lights connected in series, the string of lights comprising a conductor with an insulated covering extending between a plurality of sockets, each socket configured to releasably receive a light bulb, conductor ends connected to a plug which, when connected to a source of electricity, completes the electrical circuit and lights the lights; the device comprising a pliers-like apparatus including one opposed movable jaw and another opposed movable jaw to releasably grasp a pair of conductors leading to a socket, a plurality of conductively interconnected prongs carried by one of the opposed jaws, wherein closing the opposed jaws causes the prongs to penetrate the insulated covering causing the socket to be short circuited, the improvement comprising:

the pliers being made from a non-conducting material and including means for aligning the conductors with the prongs whereby closing of the opposed jaws causes the prongs to penetrate the insulation and short circuit the socket, whereby the string of lights is lighted when an open circuit is shorted.

2. The device of claim 1 wherein said means for aligning the conductors with the prongs comprises:

the opposed movable jaws comprising a prong supporting jaw and an anvil jaw;

said anvil jaw including a pair of spaced transverse grooves formed therein to nestingly receive the conductors, and a raised peak between transverse grooves to separate and guide the conductors into said transverse grooves; and

said prong supporting jaw includes a two-pronged, conductively interconnected conductor, said two prongs aligned to penetrate the conductors.

3. The device of claim 2 wherein said two-pronged, conductively interconnected conductor comprises a double-pointed tack with the spacing between points configured to conform with the spacing between said pair of spaced transverse grooves.

4. The device of claim 2 wherein said prong supporting jaw further comprises a raised peak between the prongs of said two-pronged, conductively interconnected conductor to separate and align the conductors with said prongs.

5. The device of claim 3 wherein said prong supporting jaw further comprises a prong supporting recess formed in said jaw to snugly receive said double-pointed tack.

6. The device as defined in claim 1 wherein:

said means for aligning the conductors with the prongs comprises a pair of spaced transverse grooves formed in one of the opposed jaws of the pliers; and

another of the opposed jaws includes a strip of metal attached thereto comprising a serrated edge, said serrations sufficiently pointed to penetrate the conductor insulation, said strip of metal defining the plurality of conductively interconnected prongs.

7. The device as defined in claim 6 further comprising a metal anvil strip secured to said one opposed jaw, said anvil strip including spaced transverse grooves, and further including a longitudinal groove to receive said strip of metal when the opposed jaws close.

8. The device as defined in claim 5 further comprising a crimping means for repairing a broken conductor.

9. The device as defined in claim 8 wherein the crimping means comprises a pair of ridges extending upward from said anvil jaw, said ridges configured to collapse a sleeve and conductively interconnect the ends of a conductor.

10. A device for locating an open circuit in a string of lights connected in series substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

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